

### **Remarks/Arguments**

Claims 50-68 were pending in the application. Claims 50-62 and 64-68 are rejected. Claim 63 is objected to. By the foregoing amendment, claims 50 and 56 are amended. No new matter is presented. Applicants request reconsideration and a favorable decision in light of the below remarks.

#### **Claim Rejections-35 U.S.C. §112**

Claims 50-60 are rejected under 35 U.S.C. §112 first and second paragraph. Applicants traverse the rejection.

Independent claims 50 and 56 have been amended to include a cable which extends through a bore of the shaft. Examiners concerns regarding §112 first and second paragraph have been alleviated.

In light of the forgoing, it is believed that claims 50-60 are in compliance with §112 first and second paragraph and an early indication of the same is respectfully requested.

Applicant submits that independent claims 50 and 56 and dependent claims 51-55 and 57-60 are in compliance with §112 first and second paragraph and are in condition for allowance.

#### **Claim Rejections-35 U.S.C. §103**

A. Claims 50-60 and 68 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No.

6,730,020 to Peng et al. ("Peng") in view of U.S. Pat. No. 4,393,728 to Larson et al. ("Larson"). Applicants traverse the rejection.

As stated by the Examiner, Peng does not specifically disclose the shoulder of the sleeve 340 is a convex shape; and, neither Peng or Larson show the difference in diameter between the plurality of beads as currently claimed. In addition, Peng does not teach the plurality of alternating beads as currently claimed. On the contrary, Peng teaches a ball and socket wedge design that will not perform as intended if modified to the alternating beads of the current invention. Furthermore, Larson does not teach the currently claimed convex shape at the line of contact. As a result, a person of ordinary skill in the art would never be predictably led to the current invention as claimed through the modification of Peng and Larson. Modification of Peng and Larson, as contemplated by the Examiner, would render the two references unsatisfactory for their intended purpose.

In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983). Independent claims 50, 56 and 68 are drawn to alternating beads with differing diameters with a **convex shape at a line of contact**. Specification, page 5, line 17-page 6, line 8. Peng is drawn to alternating ball joint 350 and sleeve 340. Peng, Figures

36-37; Column 25, lines 15-52. The Examiner erroneously labels Peng's ball joint **350** and sleeve **340** as "beads." It is the use of the words in the context of the written description and customarily by those skilled in the relevant art that accurately reflects both the "ordinary" and the "customary" meaning of the terms in the claims. *Ferguson Beauregard/Logic Controls v. Mega Systems*, 350 F.3d 1327, 1338, 69 USPQ2d 1001, 1009 (Fed. Cir. 2003). The Examiner must examine the claim language as it reflects the Specification and the ordinary and customary meaning of the term within the art. The Examiner cannot arbitrarily label a ball and socket joint as "beads." As argued throughout the prosecution history of this application, a bead is not a sleeve or a socket. It is well known within all geometrical sciences that a bead is round in shape. A socket or sleeve is anything but round and is therefore not a bead. A person of ordinary skill in the art would not equate Peng's ball and sleeve with the plurality alternating beads as currently claimed.

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Peng does not teach the convex shape and the line of contact as currently claimed because Peng teaches a ball **350** and sleeve **340** joint, wherein the ball is designed to fit inside the sleeve. "Ball joints **350** and sleeves **340** are shaped so as to fit together as shown in FIG. 38, ... in some implementations of FIG. 38, each ball joint is made from hard plastic having a first

hardness and each sleeve is made from a hard plastic having a second hardness (different from the first hardness) so that the harder material wedges into the softer material).” Peng, Figures 36-37; Column 25, lines 15-52. Each sleeve 340 surrounds each ball 350. The sleeves 340 surround the balls 350 in order to create a biting action with shoulders 342 and 343. The current application clearly claims that the “second bead is supported on the surface of two adjacent first beads at a line of contact, and the surface of each of the second beads has a convex shape at the line of contact.” The bead structure of the present application is a unique inventive structure employed to prevent the shaft from becoming rigid when a high axial load is applied to the cable. The smooth surface of the convex torus does not bite into the other bead. If the second bead was a cylinder, such as a socket, the convex torus would create a sharp point on the inside of the cylinder, such as the point created from Peng’s 342 and 343. This sharp point would bite into the subsequent bead under an axial load and cause the flexible shaft to become rigid. The convex torus design of the bead structure of the present application differs from the ball and sleeve configuration of Peng because the flexible shaft stays flexible under a high axial load. Peng’s ball and sleeve biting wedge design does not contain a plurality of alternating beads and will not perform as intended if the sleeve 340 does not surround the ball 350. Modification of Peng, as suggested by the Examiner, would not only result in unpredictable results, modification would also result in the complete failure of the Peng invention for its intended purpose. In addition, by teaching a wedging mechanism based on a differing

hardness between the sleeve and the ball, Peng teaches away from the novel alternating beads of differing diameter of the current invention. Taken as a whole, there is no teaching/suggestion/motivation for a person of ordinary skill in the art to modify Peng by changing Peng's wedging ball and sleeve design to the alternating beads of differing diameters of the present invention.

A rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art. *KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, \_\_\_, 82 USPQ2d 1385, 1395 (2007). Larson teaches a non-analogous flexible robotic arm. The Examiner relies upon Larson for a teaching of a "convex shape at a line of contact." Larson does not mention a specific convex shape at a line of contact. The line of contact of the present invention transmits less torque or force to the blood vessel when the surgeon moves the handle assembly away from the surgical site. Specification, page 6, lines 10-26. On the contrary, Larson teaches a pulling action to bend the robotic arms, i.e. more force or torque is exerted for movement. Larson, Column 3, lines 24-35 (teaching that the robot arm is bent by pulling wires having good tensile strength). Larson is non-analogous art because Larson is drawn to a differing purpose and problem to be solved. Larson is drawn to robotic arms; while, the current

invention is drawn to medical devices that must exert as little force as possible to delicate living tissue. By teaching a mechanism that exerts more force upon the bending motion, Larson teaches away from the purpose of the line of contact as presently claimed. A person of ordinary skill in the art would not equate the pulling and bending mechanism of robotic arms with the delicate mechanisms needed for medical devices.

Since Peng is specifically drawn to a ball and sleeve configuration that will not perform as intended if converted to a ball and ball configuration, it is clear that neither Peng or Larson contemplate the device as currently claimed. As a result, a person of ordinary skill in the art could never be predictably led to the current invention as claimed through the combination of Peng and Larson. The plurality of alternating beads with differing diameters of the current invention is truly a novel concept that does not equate to ball and socket/sleeve devices or robot arms.

The Examiners arguments based upon inherency and design optimization are erroneous. Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). The Examiner has failed to establish a *prima facie* case of obviousness based upon the combination of Peng and Larson. As a result, any inherency in the probabilities or possibilities are also erroneous. A person of ordinary

skill in the art would never be predictably led to the current invention as claimed; therefore, a person of ordinary skill in the art would never be motivated to optimize ranges or vary parameters. There is a large structural difference in the axial loads between wedging ball and sleeve devices and the plurality of alternating convex beads as currently claimed. Persons of ordinary skill in the art would not incorporate alternating beads of differing diameters in Peng's ball and sleeve joint of differing hardness and persons of ordinary skill in the art would not incorporate a ball and sleeve medical device into Larson's robot arm. Nothing in Peng or Larson teaches the device of the current invention. The device of the current invention is NOT 'necessarily present' in Peng's teaching of specific ball and sleeve configurations and/or Larson's teaching of a robot arm. When Peng and Larson are properly taken as a whole a person of ordinary skill in the art would not be predictably led to the invention as claimed in independent claims 50, 56 and 68.

In order to achieve the present invention as claimed in independent claims 50, 56 and 68, as suggested by the Examiner, a person of ordinary skill in the art would need to modify Peng to not include the ball and sleeve of differing hardness, to somehow include alternating beads of differing diameters at a convex line of contact, and to somehow further alter Peng in order to incorporate the teachings of Larson's robot arm. There is absolutely no predictability of success in the modification and combination of Peng and Larson.

Applicants contend that the Examiner's conclusion of obviousness over Peng and Larson is based on improper hindsight reasoning gleaned from the Applicants disclosure. The references have not been taken as a whole. The proposed modification of the reference would render them unsatisfactory for their intended purposes. One skilled in the art would not be lead to the current invention as claimed through modification of Peng and Larson. There is no reasonable expectation of success in the modification of Peng and Larson.

The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). See also *KSR*, 550 U.S. at \_\_\_, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval). Taken as a whole, Peng's specific ball and sleeve teaches away from the current application as claimed. One of ordinary skill in the art would have to vary all parameters, go against the teachings of Peng by not using a ball and sleeve design, and/or try each of numerous possible variations regarding Larson. Applicants contend that predictable modification of Peng in view of Larson would not lead a person of ordinary skill in the art to the device as currently claimed. Furthermore, Applicants contend that the Examiner has not established a prima facie case of obviousness. When the references are taken as a whole, it is apparent that a person of ordinary skill in the art would never create the novel device as



specifically claimed because the person of ordinary skill in the art would have to proceed contrary to the teaching of the references, contrary to the desired performance of the references, contrary to the definition of a 'sleeve,' contrary to Larson's pulling action, and contrary to the accepted wisdom in the art.

In light of the forgoing, it is believed that claims 50-60 and 68 are patentably distinct from the art on record and an early indication of the same is respectfully requested.

Applicant submits that independent claims 50, 56 and 68 and dependent claims 51-55, 57-60 and 62-67 are patentably distinct from the art of record and are in condition for allowance.

B. Claims 61, 62 and 64-67 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,139,563 to Cosgrove, III et al. ("Cosgrove") in view of U.S. Patent No. 6,730,020 to Peng et al. ("Peng") in further view of U.S. Pat. No. 4,393,728 to Larson et al. ("Larson"). Applicants traverse the rejection.

As stated by the Examiner, Cosgrove does not disclose the plurality of alternating convex beads; Peng does not specifically disclose the shoulder of the sleeve 340 is a convex shape; and, neither Cosgrove, Peng or Larson teach/suggest/disclose the difference in diameter between the plurality of beads as currently claimed. In addition, Cosgrove and Peng do not teach the alternating beads as

currently claimed; and, Larson does not teach the line of contact as currently claimed and is non-analogous art. On the contrary, Cosgrove and Peng teach a ball and socket/sleeve wedge design that will not perform as intended if modified to the plurality of alternating beads of the current invention. Furthermore, Larson does not teach the currently claimed convex shape at the line of contact. As a result, a person of ordinary skill in the art would never be predictably led to the current invention as claimed through the modification of Cosgrove, Peng and Larson. Modification of Cosgrove, Peng and Larson, as contemplated by the Examiner, would render the three references unsatisfactory for their intended purpose.

Referring to the application, lines 9-10 of claim 61 clearly recite "a plurality of alternating first beads and second beads" and lines 15-16, of claim 61 clearly state that "each of the second beads has a convex shape." Cosgrove discloses "a series of interconnected ball and socket segments 38." Cosgrove, FIGS. 7d-7e, Column 5, lines 46-59. Cosgrove discloses interconnected ball and socket joints not alternating convex shaped beads. Cosgrove's interconnected ball and socket joints are not comparable to the "plurality of alternating first beads and second beads" diagramed in FIGS. 3A and 3B of the present application.

In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have

been obvious. *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983). By definition and simple comparison, one can easily see that the ball and socket configuration of Cosgrove's FIGS. 7d and 7e are not the same as the "plurality of alternating first beads and second beads" diagramed in FIGS. 3A and 3B of the present application and recited in lines 9-10 of claim 61. As stated above, a person of ordinary skill in the art would not simply disregard Cosgrove's and Peng's teachings of a ball and socket/sleeve and substitute beads without any reference or suggestion or motivation in Cosgrove, Peng or Larson.

In supporting a rejection based upon obviousness the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). Replacing Cosgrove's ball and socket configuration 38, with the first and second beads 36a and 36b of the present application without establishing any *prima facie* evidence as to whether one of ordinary skill in the art would perceive Cosgrove's ball and socket configuration as interchangeable with the present applications first and second beads is erroneous. As stated above, the smooth surface of the convex torus does not bite into the other bead. Cosgrove's and Peng's ball and socket/sleeve biting wedge design does not contain alternating beads and will not perform as intended if the sleeve/socket does not surround the ball. Modification of

Cosgrove and Peng, as suggested by the Examiner, would not only result in unpredictable results, modification would also result in the complete failure of the Cosgrove and Peng inventions for their intended purposes. In addition, by teaching a wedging mechanism based on a differing hardness between the sleeve and the ball, Peng teaches away from the novel alternating beads of differing diameter of the current invention and by teaching a wire pulling mechanism is used to bend the arm, Larson teaches away from the purpose of the line of contact as presently claimed. Taken as a whole, a person of ordinary skill in the art would not be motivated to modify Cosgrove and Peng by changing their wedging ball and socket/sleeve design to the plurality of alternating beads of differing diameters of the present invention.

Based upon the foregoing, the rejection put forth by the Examiner lacks *prima facie* evidence and does not arrive at the subject matter of independent claim 61, and this rejection is therefore in error and should be reversed.

In addition, line 16 of claim 61 clearly calls for the structure of the second beads as "a convex shape at the line of contact," which is absent from Cosgrove, Peng and Larson. Cosgrove and Peng make no mention of beads, and neither mention second beads that contact the first beads along a line of contact, for the second beads to have a convex shape at the line of contact, and that the second beads have a larger inner diameter than each of the first beads. The Examiner concedes that base reference Cosgrove as applied to claim 61 makes no mention of these

structures; however, the Examiner relies upon Peng, Larson and obvious design choice for the teaching of these structures. As stated above, Peng, Larson, inherency and obvious design choices fail in this regard.

Independent claim 61 calls for the second beads to contact the first beads along a line of contact, and for the second beads to have a convex shape at the line of contact (Application, LC in FIG. 3A), while Peng's and Cosgrove's ball and socket/sleeve have straight surfaces at the line of contact. This difference is not a trivial difference, nor is it a matter of an obvious design choice. The structures of the present invention are unique because they are intended to maintain flexibility when under compression caused by operation of an internal cable or other member for actuating some function of a surgical instrument. When under such compression, some deformation of the adjacent surfaces will take place and, invariably, there will be a greater surface area of contact between two components where one has a flat surface, such as Cosgrove's and Peng's, than there will be between two components where that same component has a convex surface, such as the convex surface of the present application. Larson's teaching of curved elements in contact with one another bent by exerting force upon an internal wire does not alleviate the many deficiencies noted above in both Cosgrove and Peng.

Applicants contend that the Examiner's conclusion of obviousness over Cosgrove, Peng and Larson is based on improper hindsight reasoning gleaned from the Applicants

disclosure. The references have not been taken as a whole. The proposed modification of the reference would render them unsatisfactory for their intended purposes. One skilled in the art would not be lead to the current invention as claimed through modification of Cosgrove in combination with Peng and Larson. There is no reasonable expectation of success in the modification of Cosgrove, Peng and Larson.

The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). See also *KSR*, 550 U.S. at \_\_\_, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval). Applicants contend that the Examiner has not established a prima facie case of obviousness. When the references are taken as a whole, it is apparent that a person of ordinary skill in the art would never create the novel device as specifically claimed because the person of ordinary skill in the art would have to proceed contrary to the teaching of the references, contrary to the desired performance of the references, contrary to the well known teachings of 'ball and socket/sleeve' and contrary to the accepted wisdom in the art.

In light of the forgoing, it is believed that claims 61, 62 and 64-67 are patentably distinct from the art on

record and an early indication of the same is respectfully requested.

Applicant submits that independent claim 62 and dependent claims 62 and 64-67 are patentably distinct from the art of record and are in condition for allowance.

#### CONCLUSION

In light of the foregoing, it is submitted that all of the claims as pending patentably define over the art of record and an early indication of same is respectfully requested.

An earnest and thorough attempt has been made by the undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding issues, which remain in this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims as amended herein patentably define over the art relied on by the Examiner and early allowance of same is courteously solicited.

Please charge any fees or deficiency or credit any overpayment to our Deposit Account of record.

Respectfully submitted,  
for

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